Foundation NUMBER

WHICKHAM SCHOOL

Standard Form

This is always in the form $x \times 10^n$, where $1 \leq x < 10$. For very big numbers, n will be positive and for very small numbers n will be negative.

Squares, Cubes and Roots

Square Numbers

Square numbers are found by multiplying a number by itself.

1, 4, 9, 16, 25, 36, 49, 64, 81, 100...

The square root is the inverse, for example, the square root of 25 is 5.

Cube Numbers

Cube numbers are found by multiplying a number by itself, and multiplying by itself again.

1, 8, 27, 64, 125...

The cube root is the inverse, for example, the cube root is 64 is 4.

Mathematical Symbols

≠ is not equal to

< is less than

≤ is less than or equal to

> is greater than

≥ is greater than or equal to

Estimation

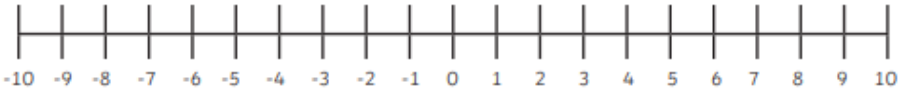
To estimate a calculation, round all numbers to one significant figure.

E.g. Estimate 3.1×495

$3.1 \times 495 \approx 3 \times 500$

$3.1 \times 495 \approx 1500$

Negative Numbers



You can use a number line to help you with calculations. When we add we go **up** the number line (right), when we subtract we go **down** the number line (left).

When **adding** or **subtracting** negatives, if the signs appear next to each other and are different, you subtract. When the two signs appear next to each other and are the same, you add.

E.g. 4 + -3 = 1

2 - -7 = 9

When **multiplying** and **dividing** negatives, remember: when the signs are different the answer is negative; when the signs are the same the answer is positive.

E.g. 2 × -5 = -10

-28 ÷ -7 = 4

Bounds and Accuracy

The **upper bound** of a number is the largest possible number it could have been before rounding.

The **lower bound** of a number is the smallest possible number it could have been before rounding.

E.g. A number has been rounded to the nearest whole number. The answer is 15.

Its lower bound is 14.5 and its upper bound is 15.5

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Types of Number

odd – end in 1, 3, 5, 7, 9

even – end in 0, 2, 4, 6, 8

prime – has exactly two factors, 1 and itself. E.g. 2, 3, 5, 7, 11...

factor – a number that divides exactly into another number, e.g. 3 is a factor of 9

highest common factor – the largest factor common to two or more numbers.

multiple – a number in the times table of another, e.g. 10 is a multiple of 5

lowest common multiple – the smallest number in two different times tables.

reciprocal – the number you would have to multiply by to get 1.

E.g. the reciprocal of 3 is $\frac{1}{3}$

The reciprocal of $\frac{1}{5}$ is 5

The reciprocal of $\frac{2}{7}$ is $\frac{7}{2}$

BIDMAS

The order in which all calculations should be done:

Brackets **I**ndices **D**ivide **M**ultiply **A**dd **S**ubtract

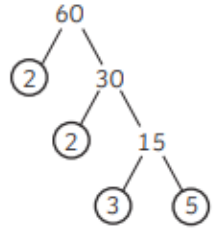
Mixed Numbers

To change an improper fraction into a mixed number, divide the numerator by the denominator to give the whole number. Find the remainder and write this as the new numerator, e.g. $\frac{16}{3} = 5\frac{1}{3}$

To change a mixed number into an improper fraction, multiply the whole by the denominator, add the numerator, then write this answer as the new numerator, e.g. $4\frac{2}{5} = \frac{22}{5}$

Writing a Number as a Product of its Prime Factors

Use a prime factor tree, but don't forget to write your final answer as a product (multiplied) using indices where necessary.



So, $60 = 2^2 \times 3 \times 5$

Fractions

To multiply, multiply the numerators and the denominators.

To divide, remember KCF (**K**eep, **C**hange, **F**lip).

To add or subtract, make sure the denominators are the same by finding the lowest common multiple.

Higher NUMBER

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Learn all the foundation key facts and remember these top tips!

Recurring Decimals

To change a recurring decimal to a fraction, follow these steps. Your aim is to ensure you have two decimals which have the same numbers after the decimal point.

E.g. change $0.2\dot{3}\dot{5}$ to a fraction.

Let $x = 0.2\dot{3}\dot{5}$

$10x = 2.\dot{3}\dot{5}$

$1000x = 235.\dot{3}\dot{5}$

Subtracting these two gives

$990x = 233$

Solving gives

$x = \frac{233}{990}$

Surds

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$

$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

$(\sqrt{a})^2 = a$

To **simplify** a surd, write it as the product of two factors, one of which must be a square number.

E.g. $\sqrt{50} = \sqrt{(25 \times 2)}$

$= 5\sqrt{2}$

To **rationalise the denominator** of a fraction which has just one term on the bottom, you can multiply both the numerator and denominator by this number.

E.g. $\frac{5}{\sqrt{2}} = \frac{5}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{5\sqrt{2}}{2}$

If the denominator has two terms, change the sign between them and multiply both the numerator and denominator by this.

E.g. $\frac{7}{2 + \sqrt{3}} = \frac{7}{2 + \sqrt{3}} \times \frac{2 - \sqrt{3}}{2 - \sqrt{3}}$

$\frac{14 - 7\sqrt{3}}{4 - 3} = 14 - 7\sqrt{3}$